

**DIABROTICA AND TWO NEW GENERA (COLEOPTERA,
CHRYSOMELIDAE)**

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Our yet fragmentary knowledge of native pests is exposed by discovery in Indiana and Quebec of a new species of cucumber beetle. Its study demands proposal of a new generic concept to include it and its supposedly well-known relatives which have been included in *Diabrotica*. A second new genus seems needed to include an Arizonian species and its tropical relatives. To avoid confusion with the economic literature on wheat jointworms, it seems desirable to suppress an old, unused generic name, *Isosoma*, which might otherwise be revived for the striped cucumber beetles or some other economic group.

Taxonomic trouble also involves our supposedly best known species, the 12-spotted cucumber beetle. An asparagus beetle, now in *Crioceris*, was named *Chrysomela duodecimpunctata* by Linnaeus, 1758, and when Fabricius, 1775, applied the same name to a different species it was a primary homonym. Source of the Fabrician type is unknown, as is also its identity with our pest. The Code forbids use of the homonym. So the paradoxical course of describing the form we have called *Diabrotica duodecimpunctata* as if it were new seems necessary. It often demanded the attention of our good Chief, who built our Bureau, and it seems proper it should be named for one whom we so greatly loved. Four closely allied forms show no structural distinctions even in the armature of the internal sac, but are distinguishable by color differences as given in the key.

DIABROTICA Chevrolat

Diabrotica Chevrolat, 1837, in Dejean, Cat. Coleop., 3d ed., p. 404 (p. 380 in the later printed "1833" edition). Genotype, *Crioceris fucata* F., 1787, by present designation.

This generic name was proposed to include 103 listed American species, among which were 15 Fabrician and a few other valid names. In the above-selected genotype, which was mentioned again with his generic description by Chevrolat, 1844, the aedeagal structure resembles that in our *undecimpunctata*, *balteata*, *longicornis*, *atripennis*, *lemniscata*, etc., and defines

the genus by the strong, dorsal articulated process covering the orifice which opens like a bird's bill to permit evagination of the internal sac with its complex armature. The admirable treatment of Brazilian *Diabrotica* by Araujo Marques, 1941 (Bolotim da Escola Nacional de Agronomia No. 2), delineates aspects of this intricate armature as the processes are packed inside the invaginated internal sac within the median lobe, but knowledge of their shapes and positions can come only if the sac be completely evaginated and inflated (pl. 13, fig. 1, 1c, 1d). In *D. piticornis* Horn and *capitata* (F., 1801) (= *melanocephala* F., 1798, not 1775, = *tripunctata* F., 1801—see discussion of *Acalymma vittata*), a tendency to extrude the internal sac laterally from beneath the base of the articulated cap piece has produced an emargination on the left side of the median lobe near its middle, exposing sclerotized armature of the internal sac very different from that in the group of 12-spotted forms. Other minor modifications of aedeagal form occur in *Diabrotica* as now restricted, but several distinct generic groups are evident among tropical forms examined, although most of the 619 species listed by Weise, 1924 (in Junk, Coleop. Cat., pt. 78, pp. 25-49), are unavailable.

If genera which include previously valid species in the Dejean Catalog were to be held invalid (see my discussion, 1940, Bul. Brooklyn Ent. Soc., vol. 35, pp. 1-12), *Diabrotica*, as used for a century, would sink. *Phyllotrupes* Hope, 1840 (Coleopt. Manual, vol. 3, pp. 98, 169, 170) = *Phyllotrypes* Agassiz, 1846—both names omitted in the Junk Catalog—appear to be synonyms of *Diabrotica*, as suspected by Hope (l. c., p. 170), but the originally designated genotype, *Crioceris cyanipennis* Fabricius, 1801, is unknown to me as it was to Gahan, 1891 (Ent. Soc. London, Trans., p. 522). Many vittate species from section II, as treated by Baly, 1886 (Linn. Soc. London, Jour., vol. 19, p. 230), or by Gahan, 1891 (Ent. Soc. London, Trans., p. 416), are referable to the new genus below named *Acalymma*. Another vittate species from Arizona and its tropical relatives are given the new generic name *Amphelasma*. A third very distinct genus, *Paratriarius* Schaeffer, 1906, is defined by peculiar aedeagal structure very similar in its genotype, *Galleruca dorsata* Say, 1824 (pl. 13, fig. 8, 8a), and such tropical forms as are available among the 17 South American species placed by Gahan, 1891, in his group C of section II of *Diabrotica*, as well as in Central American *curtisii* (Baly, 1886) and *longitarsis* (Jacoby, 1887). Besides genitalic peculiarities these species exhibit a distinctive habitus and similar secondary sexual modifications.

Our North American 12-spotted cucumber beetles may be known as follows:

1. Legs and abdomen black (Pacific Coast States) (*soror* Lec., 1865)
Diabrotica undecimpunctata undecimpunctata Mannerheim, 1843
 Legs and abdomen more or less pale..... 2
2. Ventral segments black, pale at sides (Mexico)
Diabrotica undecimpunctata duodecimnotata Harold, 1875
 Ventral segments without black marks..... 3
3. Markings black and rather large; form robust (Eastern and Southern States) (*duodecimpunctata* auct.)
Diabrotica undecimpunctata howardi, new subspecies
 Markings reduced and brownish; form less robust (Yuma, Ariz.)
Diabrotica undecimpunctata tenella LeConte, 1865

***Diabrotica undecimpunctata howardi*, new subspecies**

(Pl. 13, fig. 1, 1a, 1b, 1c, 1d)

?*Chrysomela duodecimpunctata* F., 1775 (not L., 1758).

Diabrotica duodecimpunctata, auct.

Differs from *D. undecimpunctata* Mann. (not Jac.) only by its pale abdomen and femoral bases and by its habitat.

Holotype male and eight paratypes, U. S. National Museum Cat. No. 58367, collected at Washington, D. C., October 24, 1943, by L. J. Bottimer. Habitat, eastern and southern States.

***Diabrotica mauliki*, new name**

Diabrotica undecimpunctata Jacoby, 1879 (not Mannerheim, 1843), Cist. Ent., vol. 2, p. 524; Baly, 1890, Ent. Soc. London, Trans., p. 39.

Type locality, Peru.

In appreciation of the many useful contributions by S. Maulik, of the British Museum, this change is extracted from earlier notes on *Diabrotica*.

OIDES Weber

Oides Weber, 1801. Genotype, *Chrysomela bipunctata* F., *vide* Weise, 1924. Synonym, *Isosoma* Billberg, 1820; genotype, *Chrysomela concolor* F., by present designation.

An old neglected name, *Isosoma* Billberg, 1820 (Enumeratio Insectorum, p. 56), was proposed for chrysomelid beetles now separated into several genera of Alticinae and Galerucinae, but has not since been used for any of the included species. Its homonym, *Isosoma* Walker, 1832, was extensively used for

the wheat jointworms and allies before being replaced by *Harmolita* Motschulsky, 1836. Such a mass of economic records might lead to confusion if Billberg's older name were revived for the vittate species of *Diabrotica* or any of the other economic forms to which it might now be restricted. One of the originally included species belongs in an older genus, *Oides* Weber, 1801, under which *Isosoma* can be listed in synonymy. I therefore designate the fourth of the originally included species, *Chrysomela concolor* Fabricius, 1781, as genotype of *Isosoma* Billberg, 1820. This is the species bibliographically summarized by Schoenherr, 1808 (*Syn. Ins.*, vol. 1, pt. 2, p. 231), as cited by Billberg.

ACALYMMA, New Genus

Isosoma Billberg, 1820, *Enum. Ins.*, p. 56 (part).

Characters of *Diabrotica*, but aedeagal orificial plate rudimentary, consisting of a flexible narrow sclerotized median band extending from mid-dorsal part of median lobe and more or less broadened apically to brace the internal sac, but rarely enough to close the orifice and never serving as an articulated cap piece as in *Diabrotica*. Elytra usually sulcate, punctate-striate and vittate. Antennal joint 2 much shorter than 3.

Besides the genotype, *Acalymma gouldi*, new species, this genus includes our species hitherto known as *Diabrotica vittata* (F.), *trivittata* Mann., *blandula* Lec., *vineta* Lec., as well as the Mexican species *pallipes* (Oliv.) (= *theimei* Baly), of which the aedeagi are here figured (pl. 13, figs. 2-7), and numerous tropical species.

Acalymma gouldi, new species

(Pl. 13, fig. 2, 2a, 2b)

Diabrotica, n. sp. Gould, 1944, *Indiana Agr. Expt. Sta. Bul. No. 490*, p. 5, footnote.

Length 4.5-6 mm. Pale yellow, the head, meso-metathorax, sutural and broad median elytral vittae, antennae except parts of three basal joints and legs except coxae and basal three-fourths of femora black. Surface shining, head impunctate, with shallow midfrontal impression; pronotum microscopically punctulate on lateral and anterior median convex areas. Elytra shallowly sulcate with double irregular rows of shallow punctures in the sulci. Claws cleft, the inner process or tooth a little shorter than the outer. Aedeagus (pl. 13, fig. 2, a, b) slightly narrowed in middle third, slightly expanded before orifice, the apical fifth tapering with sinuate sides to the narrowly rounded apex which bends upward before bending downward at extreme tip.

Holotype and 13 paratypes, United States National Museum Catalog No. 58368.

Type and 20 paratypes from squash, cucumber, etc., near La Fayette, Ind., June, July, 1942, collected by Geo. E. Gould, of Purdue University, who recognized specific distinctness from *vittata* among which they occurred and mentioned differences in the bulletin above cited. He also found a female specimen (paratype) labeled "Marion County, Ind., W. S. B., 9-16-20," filed as *vittata* in the Blatchley Collection. Still another paratype was recently received under the name *vineta* labeled "Berthierville, Quebec, 20-VII-40, A. Robert."

This species is very closely related to *Acalymma blandula* (Lec., 1868) = *nitida* (Linell, 1897) (pl. 13, fig. 3, 3a), but is larger, with stronger elytral sulci and punctures and less constricted, less expanded genitalia. The white elytral vitta joining the white margin near apex covers costae 2-3 in both species, while in *Acalymma vineta* (Lec., 1878) only costa 3 is white and the aedeagus (pl. 13, fig. 4, 4a) is longer and very slender. This latter species is poorly represented by a few specimens from South Carolina and Gulf States to eastern Texas, while *blandula* is well represented from western Kansas, Colorado, New Mexico and Texas. A poor sample of an entirely pale yellow form from Clemenceau, Ariz., H. R. Brisley, 1922, seems conspecific with *blandula*.

***Acalymma vittata* (Fabricius)**

(Pl. 13, fig. 5, 5a, 5b, 5c)

Cistela melanocephala Fabricius, 1775, Syst. Ent., p. 118.

Crioceris vittata Fabricius, 1775, Syst. Ent., p. 122; 1792, Ent. Syst., vol. 1, pt. 2, p. 12.

Diabrotica vittata auct., fide Houser and Balduf, 1925, Ohio Agr. Expt. Sta. Bul. No. 388; Gould, 1944, Ind. Agr. Expt. Sta. Bul. No. 490.

Diabrotica melanocephala (F.), fide Lever, 1930, Ann. and Mag. Nat. Hist. (10), vol. 6, p. 668; Rev. Appl. Ent., 1930-1946.

Believing the original Fabrician type of *Crioceris vittata* from Carolina, in the collection of a Mr. Monson, has been lost, I designate as neoholotype and neoparatypes 90 specimens collected on squash, April 18, 1938, at Charleston, S. C., by W. J. Reid, preserved in the United States National Museum. This locality is, most likely, the one from which the original type was obtained. No other Carolinian species in my experience seems to agree so well with the original description. Such confusion has resulted from the brief statement by Lever, 1930, that the type of *Cistela melanocephala* F., 1775 is the

species we have called *vittata*, that my action above indicated seems required. If, however, the authentic holotype of *vittata* can be produced and shown to be other than the species here indicated, this action will fall. Lever was not the first reviser. Fabricius himself in 1792 chose *vittata* instead of *melanocephala* as the name for this pest, and page priority claimed by Lever is not here applicable. In the same way Fabricius himself vitiated Lever's substitution of *tripunctata* F., 1801, for *melanocephala* F., 1798, when in 1801 he proposed *capitata* as substitute name for *melanocephala* F., 1798 (not *Crioceris melanocephala* F., 1775) and described *tripunctata* as a distinct species. The accompanying diagrammatic table of the confused synonymy and homonymy to be worked out from these specific names was sketched a decade ago and suggests the confusion encountered in following Fabricius' application of names in his successive publications. The chart (Text fig. 1) shows that four species named *melanocephala* by him as well as the two named *vittata* require consideration in *Crioceris* and *Cistela*, and that when he recognized the conspecific identity of North American *Cistela melanocephala* and *Crioceris vittata* and placed them as one species in *Crioceris*, he preferred to keep his previous use of *Crioceris melanocephala*

Names now used	F. 1775 Syst. Ent.	F. 1781 Spec. Ins.	F. 1787 Mant. Ins.	F. 1792 Ent. Syst.	F. 1798 Suppl. Ent. Syst.	F. 1801 Syst. El.
Acolymma vittata (F) (<i>melanocephala</i> (F) Lever 1930, RAE 1930-1946)	p 118, sp 11 <i>Cistela melanocephala</i> NA Mus Banks	vol. I, p. 148, sp 16 (same)	vol. I, p. 86, sp 22. (same) diagnose only	vol. I, pt. 2, p. 12, sp. 48 <i>Crioceris vittata</i> [<i>Cistela melanocephala</i> cited as synonym.] - Carolina Mus. Monson	—	vol. I, p. 455, sp. 27 <i>Crioceris vittata</i> Carolina "Gucumers Melone" (<i>Cistela melanocephala</i> not cited as synonym)
Synodita melanocephala (F)	p. 119, sp. B <i>Crioceris melanocephala</i> New Holland Mus Banks	vol. I, p. 152, sp. 14 (same)	vol. I, p. 87, sp. 16 (same) diagnosis only	vol. I, pt. 2, p. 3, sp. 3. (same)	—	vol. I, p. 450, sp. 7 (same) <i>Crioceris melanocephala</i> New Holland Banks
Acolymma vittata (F) (<i>melanocephala</i> (F) Lever 1930, RAE 1930-1946)	p 122, sp. 23 <i>Crioceris vittata</i> Carolina Mus. Monson	vol. I, p. 156, sp. 40 (same)	vol. I, p. 90, sp. 51. (same) diagnosis only	vol. I, pt. 2, p. 12, sp. 48 (same,—but with <i>Cistela melanocephala</i> cited as synonym.)	—	vol. I, p. 455, sp. 27. (same) <i>Crioceris vittata</i> Carolina "Gucumers Melone"
Diabrotica capitata (F) (here adapted) (<i>melanocephala</i> (F) Wense 1924 p. 38.) (<i>tripunctata</i> (F) Lever 1930, RAE 1930)	—	—	—	—	p. 95, sp. 53-4 <i>Galleruco melanocephala</i> Cayenne Richard	vol. I, p. 452, sp. 16 <i>Crioceris capitata</i> (<i>G. melanocephala</i> cited as synonym)
Phyllotreta striolata (F. 1803) (here adapted) <i>P. vittata</i> (F) Auct.	—	—	—	—	—	vol. I, p. 469, sp. 95 <i>Crioceris</i> (saltatoria) <i>vittata</i> Carolina Mus. Bosc
Alleculid ? (present name not found.)	—	—	—	—	—	vol. 2, p. 18, sp. 11. <i>Cistela melanocephala</i> Tranquebar Mus. Lund

Text Fig. 1.—Fabrician treatments of the species.

for his Australian species, now *Synodyta melanocephala*. His choice of the name *vittata* happens to comply with Article 35 of our present Code, whereas resurrection of *melanocephala* for *vittata* violates Article 36. The chart also shows that in 1801 the conflict of two species named *Crioceris vittata* F., requires suppression of the long-used name *Phyllotreta vittata* (F., 1801) under the hitherto overlooked specific name *striolata* F., 1803 (Index Syst. El., p. 38). This last-cited work is not available in Washington, but was reviewed by Illiger, 1803 (Mag. für Insektenkunde, vol. 2, p. 293), who adopted *Crioceris striolata* F. in place of the second *C. vittata*. Illiger indicated that this Index was published in Braunschweig by Fleckeisen, and included Fabricius' own proposals of new names to replace names wrongly used in his 1801 work. In 1807 Illiger, (Mag. Insk., vol. 6, p. 148) proposed the new combination *Haltica striolata* as the name for our flea beetle, but the "stillborn" homonym *vittata* F., 1801, has continued in use. The name *Phyllotreta striolata* (F., 1803) should be used for our pest instead of the homonym *Phyllotreta vittata*.

The aedeagus of *Acalymma vittata* is black, slender, and acutely pointed, its apex sinuately elevated (pl. 13, fig. 5, 5a, 5b, 5c) instead of deflexed as in *trivittata* (pl. 13, fig. 6, 6a). The evaginated internal sac of *vittata* (fig. 5b, 5c) is an unarmed, soft, elaborately lobed and constricted white organ within which seems to be retracted a black, sclerotized, hooked process which probably represents the transfer apparatus at the functional orifice. The forms of this sclerotized piece and of the inflated sac are different in *trivittata*, but the only sample yet seen is unfit for record.

***Acalymma trivittata* (Mannerheim)**

(Pl. 13, fig. 6, 6a)

Diabrotica trivittata Mannerheim, 1843, Naturforsch. Gesellsch. Moscow, Bul., vol. 16, p. 309.

Diabrotica vittata (F.), Jacoby, 1887, Biol. Centr.-Amer., Coleopt., vol. 6, pt. 1, p. 535.

Diabrotica vittata incerta Cockerell, 1896, in Webster, N. Y. Ent. Soc. Jour., vol. 4, p. 67 (not Baly, 1886).

This Californian species now is found the entire length of our Mexican boundary. The form with hind tibiae mostly white and distinguished under the homonym *incerta* Ckll., 1896, has recently been abundant about El Paso, Tex., but merges so completely with the Californian form that a new name seems unnecessary. A series from Costa Rica, January 1936, sent as *vittata* by C. H. Ballou, as on *Cucurbita pepo* L.

at San Pedro de Montes de Oca, is not distinguishable from Californian samples of *trivittata*. As mentioned under *vittata* the aedeagal apex is deflexed, acutely ogival, the orificial plate is elongate oval, strongly concave and connected by a very narrow brown strap to the middorsal sclerotized surface of the median lobe (pl. 13, fig. 6, 6a).

***Acalymma pallipes* (Olivier)**

(Pl. 13, fig. 7)

Galeruca pallipes Olivier, 1791, Eneyel. Meth. Ins., vol. 6, p. 590.

Diabrotica theimei Baly, 1886, Linn. Soc. London, Jour., vol. 19, p. 231;

Jacoby, 1887, Biol. Centr.-Amer., Coleop., vol. 6, pt. 1, p. 534.

Diabrotica pallipes (Oliv.), Weise, 1924, in Junk, Coleop. Cat., pt. 78, p. 40.

The above synonymy may be subject to revision. It appears from the original description that Olivier had and described the widely distributed tropical species in which the legs are pale and antennal joints 8, 9 and base of 10 are white (*theimei*) but that he proposed the name *pallipes* as a substitute for *Cistela melanocephala* F., 1775, which, according to Lever, 1930, is the species we have known as *vittata* F. Since the latter North American species was treated by Olivier immediately before his proposal of *pallipes* and the two are zoologically distinguishable by the coloration of the legs, it seems clear that he chose the name *pallipes* because it fitted his specimens and that the mistaken inclusion of citations to *melanocephala* should be rejected and *pallipes* adopted for *theimei* as indicated by Weise, 1924. Its aedeagus (pl. 13, fig. 7) is black, the apex pale with straight convergent margins and narrowly rounded tip, the orifice short and closed by an oblong rather broad orificial plate which is deeply concave throughout its length, strongly emarginate at apex and apparently continuous with the convex dorsal surface of the median lobe. This species has been intercepted in importations from Mexico.

AMPHELASMA, New Genus

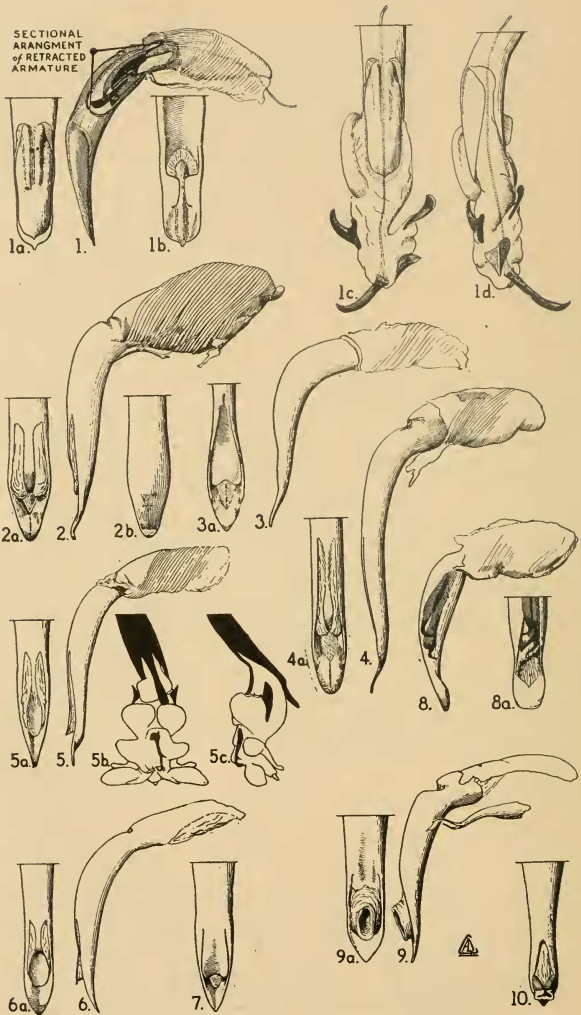
Specimens from Arizona, Mexico and Guatemala, representing several species, display a third type of aedeagal structure distinct from that in *Diabrotica*, *Paratriarius* or *Acalymma* which seems to require their removal from the former genus. They also show the midfrontal fovea and the pair of pronotal impressions as well as the sculpture and color pattern mentioned by Thomas Say in his posthumously published descrip-

tion (Boston Jour. Nat. Hist., vol. 1, p. 198, 1835) of *Galleruca cava*, which species is selected as type of this new genus. A good sample of this species was collected in April and May 1908 by the late Frederick Knab, at Cordoba, Vera Cruz, which is near the port at which Say and McClure landed in 1827. A dissected male, neoholotype, from this series of neoparatypes agrees entirely with the original description and is selected to replace the lost type of *G. cava* Say, 1835. The claws and anterior coxal cavities are as in *Diabrotica*, but the aedeagus is relatively stout, feebly concave and devoid of lamellae beneath and the apex is acute (pl. 13, fig. 9, 9a). No sclerotized armature on the internal sac is visible in cleared preparations of *A. cavum* or in closely related species. Sclerotization of the orificial membrane produces a pair of short broad plates hinged at sides of the orifice so as to open laterally as the internal sac is evaginated in some of the species, but in the genotype these areas are membranous. There is no sclerotized median process bracing the base of the internal sac, and there is no vestige of elytral costae, striae or seriate punctures as in *Acalymma*. In other species one or two pair of black pronotal spots may be present, the blue-green reflections over the black elytral vittae may be absent and the vittae themselves may be much broader as in *decorata* Jac. or very narrow as in *unilineata* Jac. This last name has been applied to two distinct but superficially similar species in the few samples before me. In one the aedeagus is stout with obtuse-acuminate apex and with feeble ventral sulcus not margined by carinae, while in the other the aedeagus resembles that of *decorata* (pl. 13, fig. 10) in being slender with apex acute-acuminate and with ventral sulcus strongly impressed between strong carinae. In specimens intercepted at Laredo and Eagle Pass, Tex., in orchids and other plant material from Mexico, the aedeagus is stout and apically obtuse with a distinct pair of orificial plates. They resemble the female type of *D. bipuncticollis* Schaeffer from southern Arizona in all superficial details.

The five described species now assignable in this genus are—

<i>Amphelasma cavum</i> (Say, 1835), genotype, (<i>Galleruca</i> , <i>Diabrotica</i>)	Mexico
<i>Amphelasma bipuncticolle</i> (Schaeffer, 1905) (<i>Diabrotica</i>)	Arizona
<i>Amphelasma decoratum</i> (Jacoby, 1887) (<i>Diabrotica</i>)	Mexico
<i>Amphelasma unilineatum</i> (Jacoby, 1887) (<i>Diabrotica</i>)	Mexico
<i>Amphelasma trilineatum</i> (Jacoby, 1887) (<i>Diabrotica</i>)	Guatemala

Definite bibliographical citations needed by those wishing to check nomenclatorial details are included in discussion, but



repetition of citations which are available in well-known catalogs or summaries indispensable to any student of this group seem sufficiently indicated by author and date.

Plate 14.—Aedeagi of *Diabrotica*, *Acalymma*, *Amphelasma*, and *Paratriarius*. Drawn by Arthur Cushman.

- Fig. 1. *Diabrotica undecimpunctata howardi*, n. subsp., lateral, showing retracted armature of internal sac; 1a, dorsal; 1b, ventral; 1c, inflated internal sac with armature, dorsal aspect; 1d, same, lateral.
- Fig. 2. *Acalymma gouldi*, n. sp., lateral; 2a, dorsal; 2b, ventral.
- Fig. 3. *Acalymma blandula* (Lec.), lateral; 3a, dorsal.
- Fig. 4. *Acalymma vincta* (Lec.), lateral; 4a, dorsal.
- Fig. 5. *Acalymma vittata* (F.), lateral; 5a, dorsal; 5b, inflated internal sac, dorsal (drawn by David Hall); 5c, same, lateral.
- Fig. 6. *Acalymma trivittata* (Mann.), lateral; 6a, dorsal.
- Fig. 7. *Acalymma pallipes* (Oliv.), dorsal.
- Fig. 8. *Paratriarius dorsatus* (Say), lateral; 8a, dorsal, with retracted armature of internal sac indicated.
- Fig. 9. *Amphelasma cavum* (Say), lateral; 9a, dorsal.
- Fig. 10. *Amphelasma decoratum* (Jac.), dorsal.